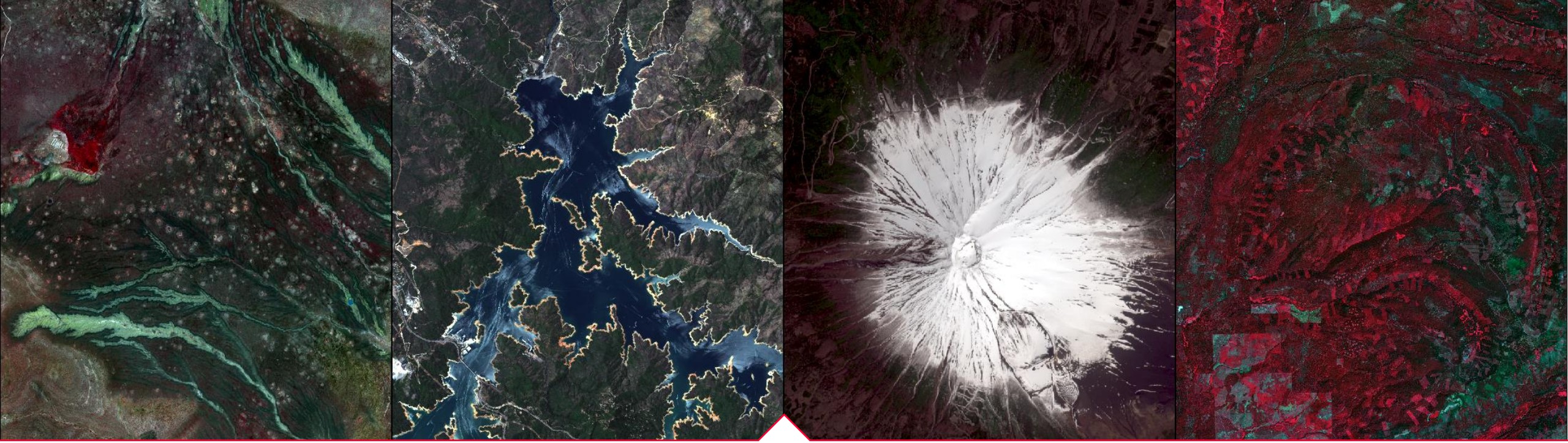

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WHAT'S NEW IN ENVI 5.6 AND IDL 8.8

July 21, 2020

Bill Okubo and Zach Norman | Product Managers

Contact Information and Introductions

Bill Okubo

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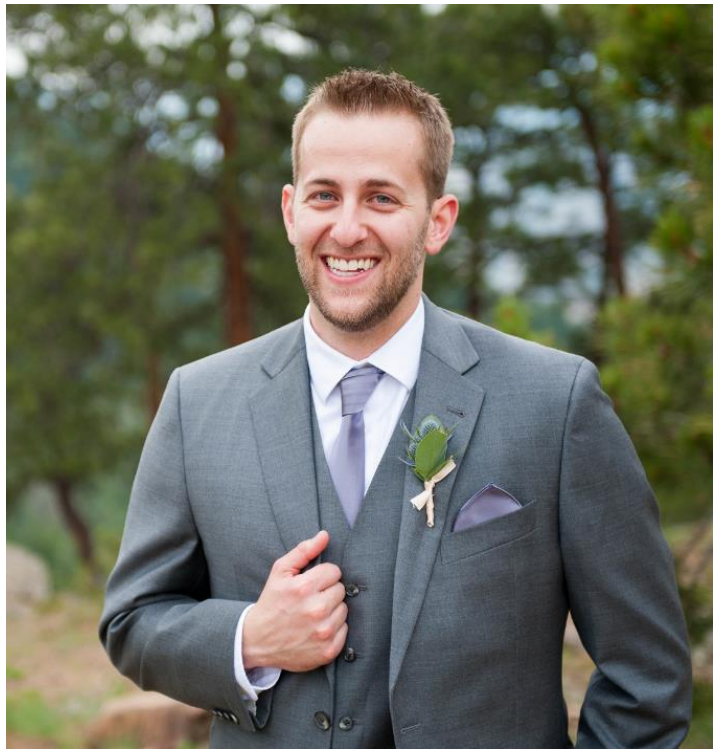

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Agenda

Introduction

ENVI Server

ENVI Updates

Library Updates and Platform Support for ENVI and IDL

Introducing the Updated IDL Workbench!

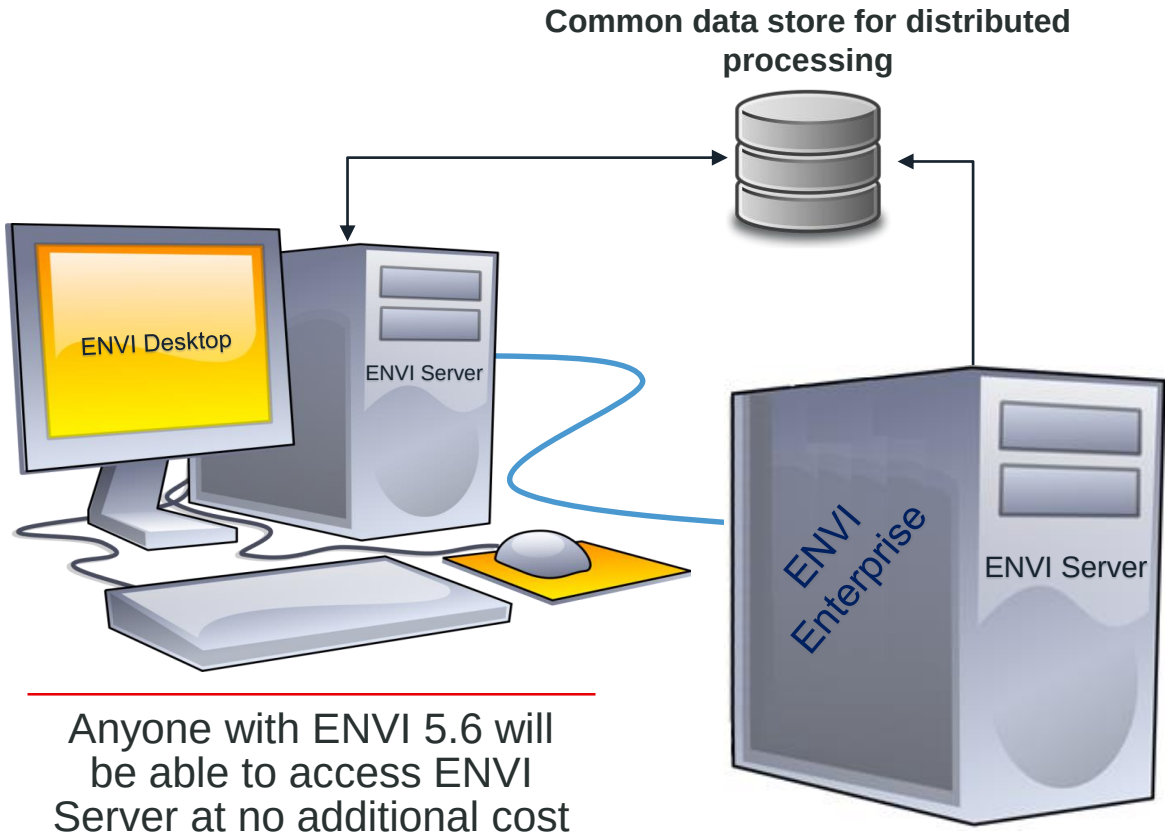
IDL 8.8 Performance Improvements

Questions and Discussion

Introducing ENVI Server!

Key Benefits:

- **Save time by running processes in parallel**
- **Run processes in the background in ENVI**
- **Take advantage of beefy machines and modern hardware**
- **Easily distribute processing to local servers with common data access**
- **<u>No programming required!</u>**



Anyone with ENVI 5.6 will be able to access ENVI Server at no additional cost

ENVI is a client for ENVI Server, meaning we can connect to machines used for dedicated processing

ENVI Server Use Cases

Here are a few scenarios where ENVI Server can be used

MULTITASKER

- A user wants to do more than one thing at a time with ENVI
- ENVI Server lets you seamlessly run processing in the background

DATA PROCESSOR

- A user has a lot of data to process
- ENVI Server lets you run multiple jobs in parallel to get through large volumes of data faster
- Process in parallel to take advantage of many CPUs and SSDs

SERVER-BASED-PROCESSING

- A user has a server with lots of data processing capabilities
- Use ENVI Server to run processing on network machines instead of small, lightweight laptops
- Assumes common data access

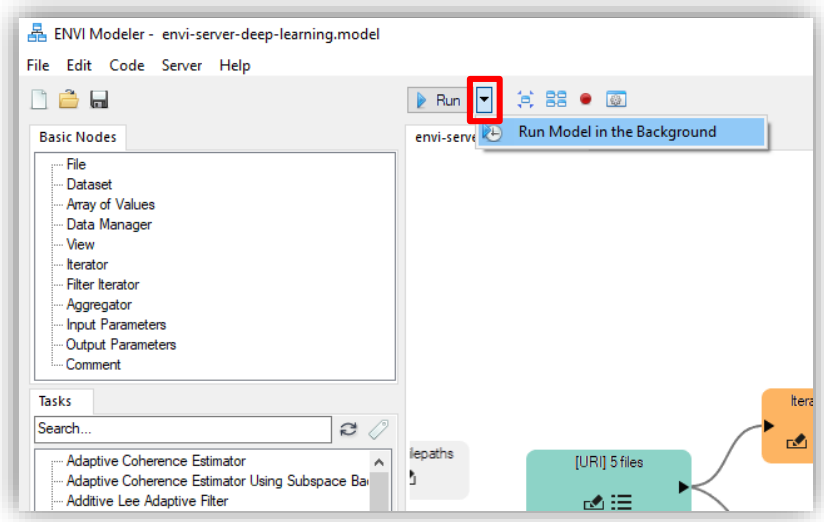
DEEP LEARNING

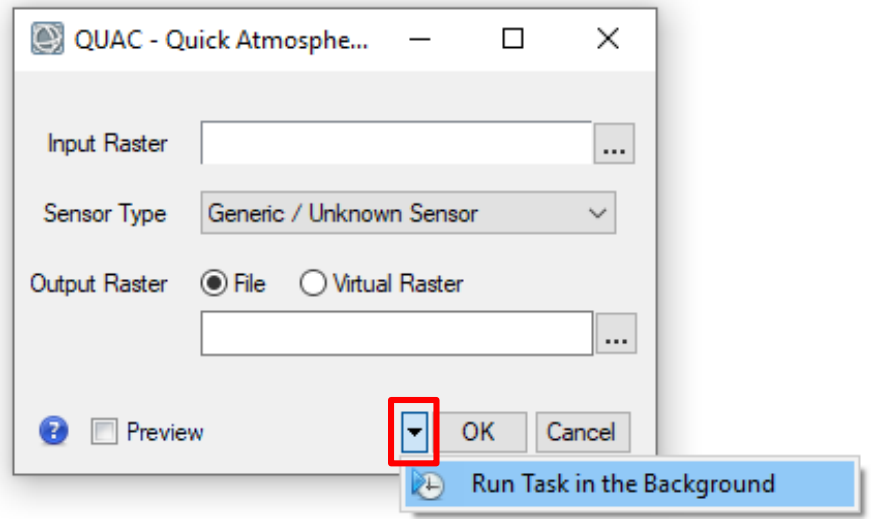
- A user doesn't have computer with a GPU good enough for deep learning
- Use ENVI Server to run deep learning processes without needing the hardware on your machine
- Assumes common data access

Accessing ENVI Server from ENVI

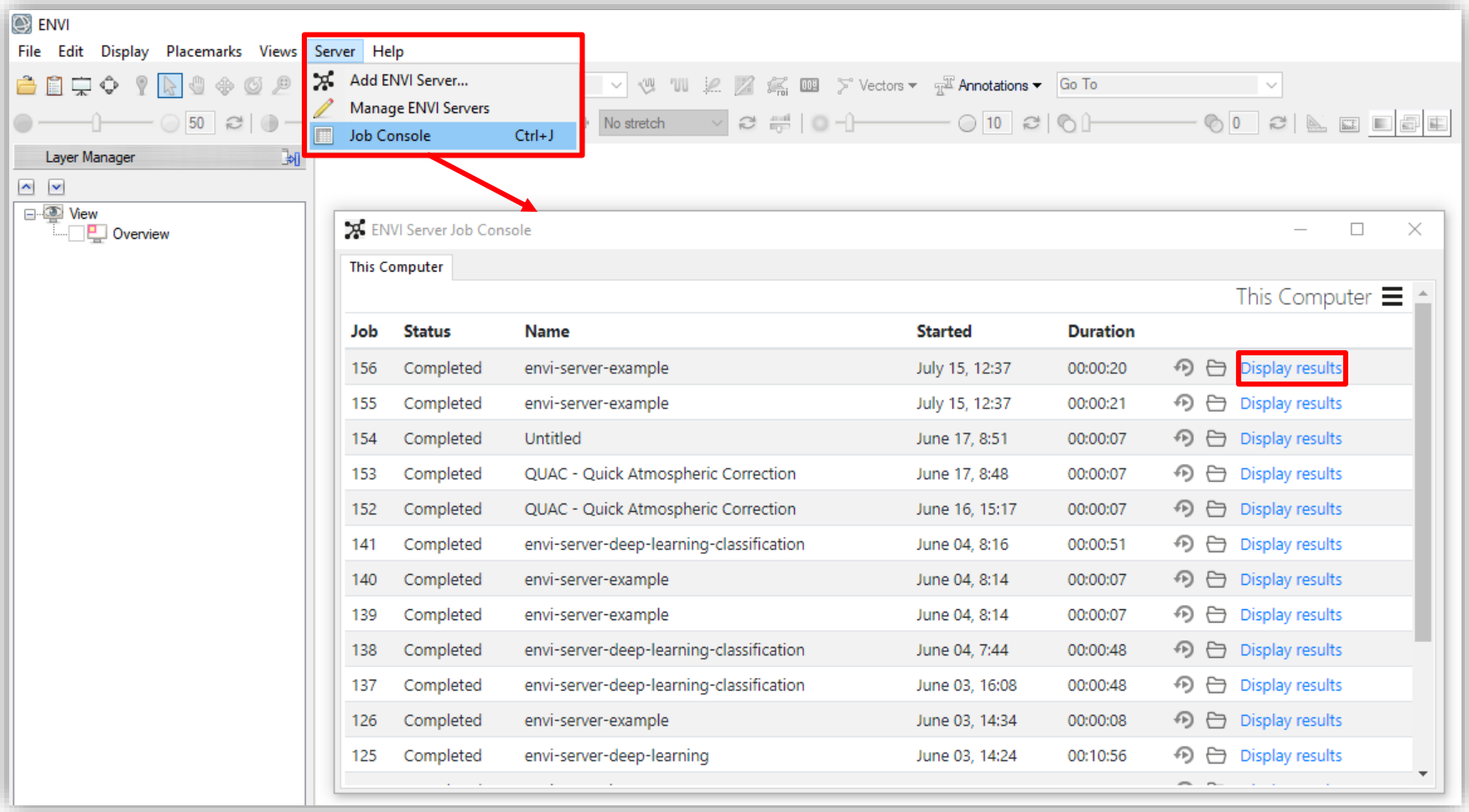
You can run processing on ENVI Server through the ENVI Modeler or any ENVI Task dialog

The red boxes on the right show you where to run processing on ENVI Server





Viewing Results

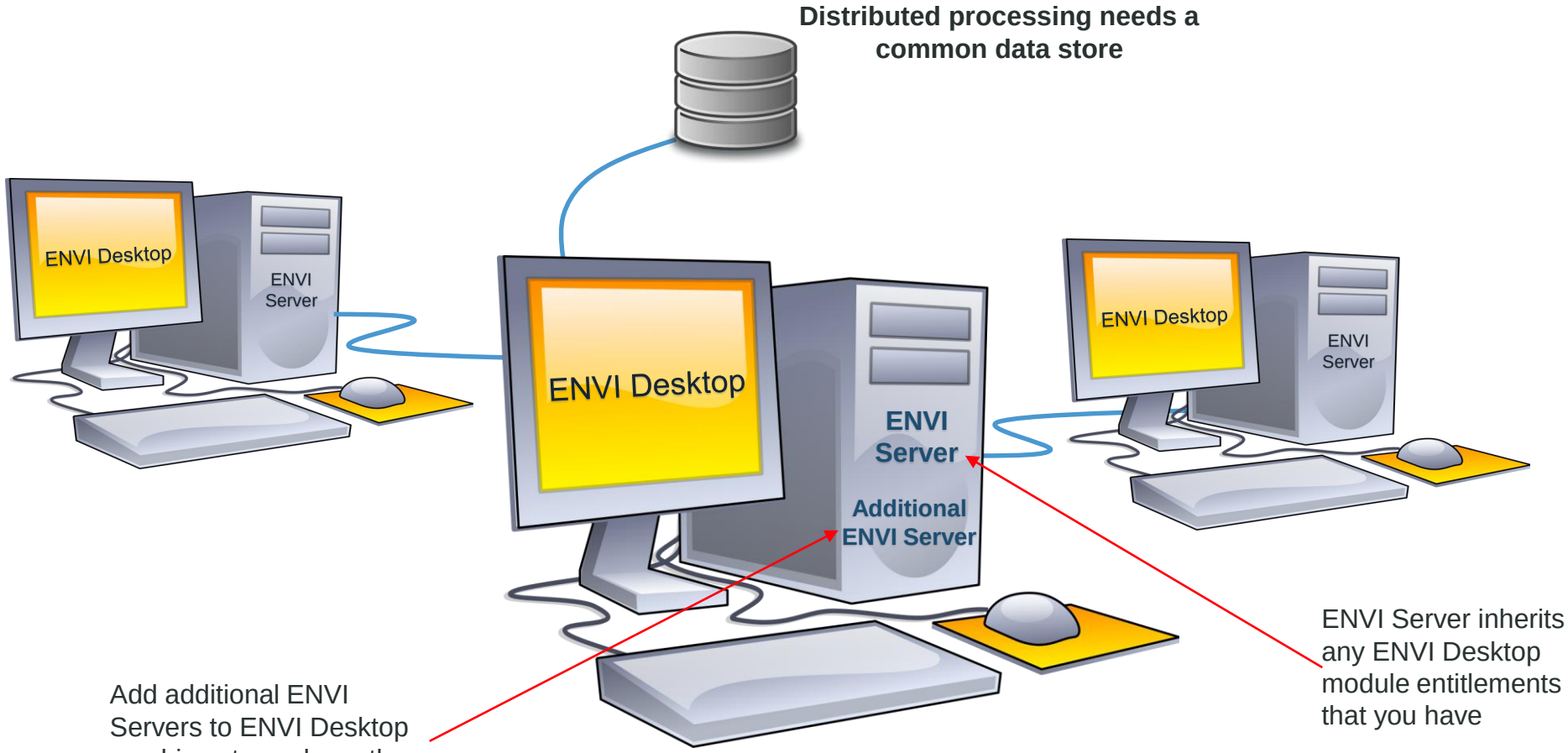


Use the ENVI Server Job Console to display results from ENVI Tasks or the ENVI Modeler

Pro-tip: To use this with the ENVI Modeler, you need to use the “Output Parameters” node in your workflows

ENVI Server Demo

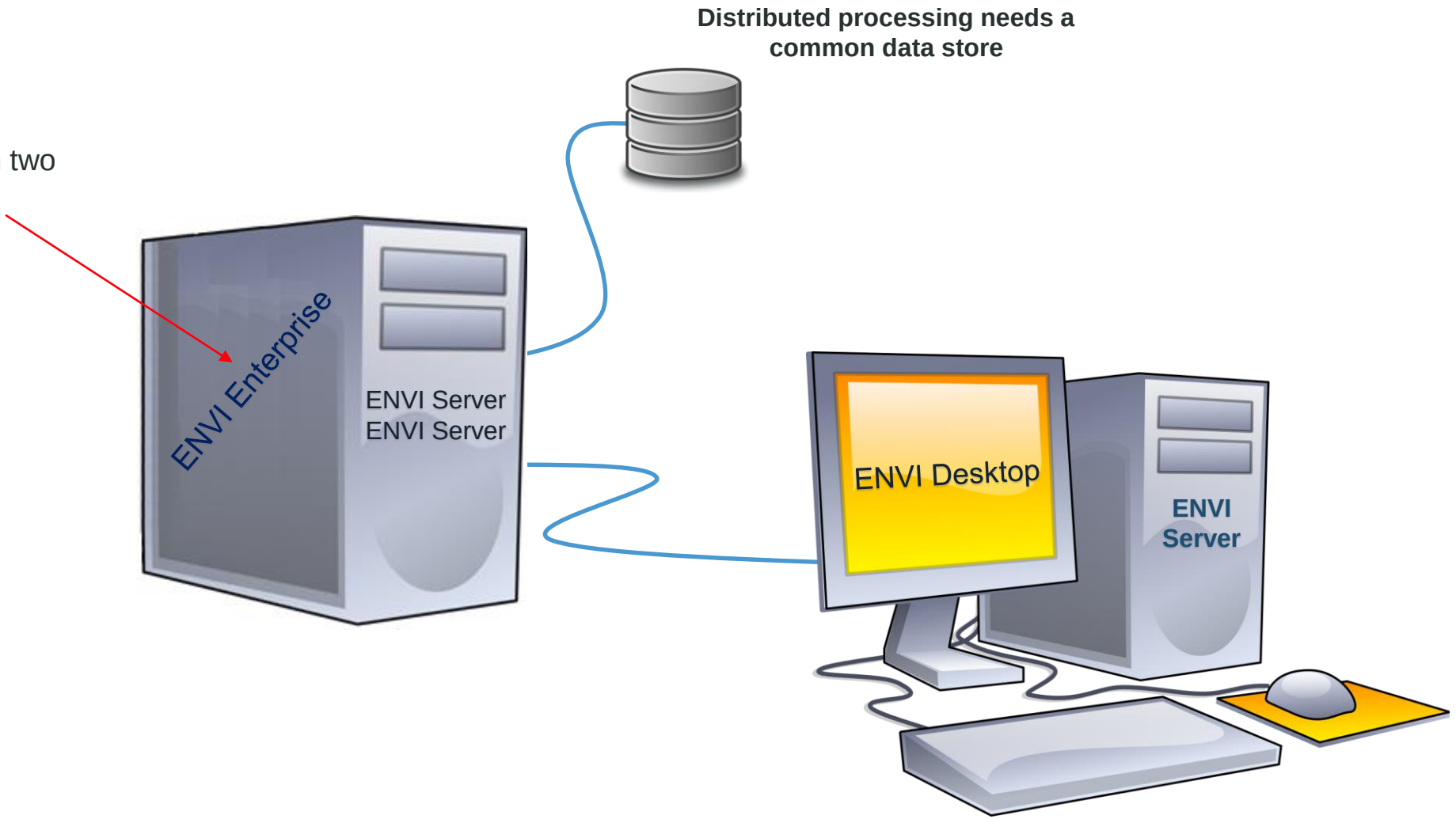
How Can You Use ENVI Server?



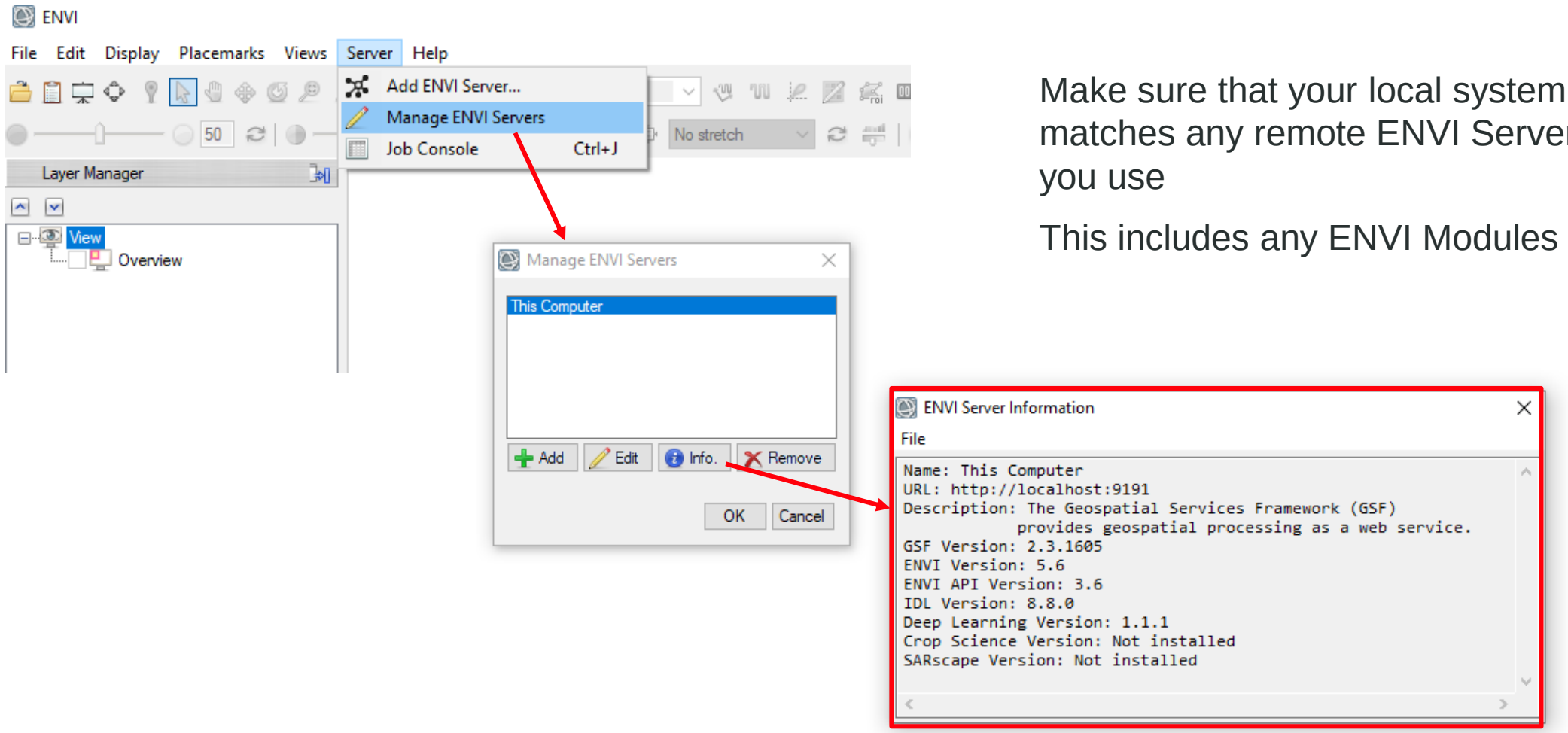
How Can You Use ENVI Server?

ENVI Enterprise comes with two ENVI Servers and includes:

- Atmospheric Correction
- Deep Learning
- Feature Extraction
- DEM Extraction
- NITF
- Crop Science



ENVI Server Need-to-know



Make sure that your local system matches any remote ENVI Servers that you use

This includes any ENVI Modules

ENVI Server for Programmers

You can use the ENVI Server API to run jobs and distribute processing

For example: I created a custom ENVIServerCluster object that split up processing between different instances of ENVI Server and managed moving the output rasters to my local machine

```
; start up ENVI
e = envi(/HEADLESS)

; make our cluster
cluster = ENVIServerCluster(['localhost', 'my-other-envi-server'])

; verify that our ENVI Servers have the same configuration as our local machine
; use STRICT to match module versions and verify the modules are the same
; on both machines
cluster.ValidateENVIServers, /STRICT

; open a Sentinel 2 raster
file = 'C:\Users\znorman\Desktop\speed-test\metadata.xml'
rasters = e.OpenRaster(File)

; specify the indices we want to calcuate
indices = ['NDVI', 'GARI', 'GNVDI', 'NDWI']

; submit tasks - the "ID" returned is the job index for a lookup in
; the cluster
for i=0,n_elements(indices)-1 do begin
  ; create our task
  Task = ENVITask('SpectralIndices')
  Task.INPUT_RASTER = raster[0]
  task.INDEX = indices[i]

  ; submit our job
  id = cluster.SubmitTask(task)
endfor

; wait for our jobs to finish and download our results
cluster.WaitForJobs, /GET_RESULTS
```

ENVI Server: Improve Performance

A great use case for ENVI Server is to speed up processing or push long-running processes to the background

To demonstrate this, we can adjust how we calculate spectral indices for a Sentinel 2 scene to optimize performance

Test Machine Details:

- **Windows 10**
- **12 CPUs (Intel)**
- **32 GB RAM**
- **SSD**

Performance improvements may vary by machine and OS

Baseline metrics for performance:

- **338 seconds** to process all four spectral indices in a **single process**
- **200 seconds** if we run **two processes**, each calculating two spectral indices
- **130 seconds** if we run **four processes**, each calculating one spectral index

With four processes being fastest at 130 seconds we use about 90% of our 12 CPUs

We may have resource conflicts for accessing the same pixels of our raster in parallel which can slow things down

ENVI Server: Optimizing Performance

A great use case for ENVI Server is to speed up processing or push long-running processes to the background

To demonstrate this, we can adjust how we calculate spectral indices for a Sentinel 2 scene to optimize performance

Test Machine Details:

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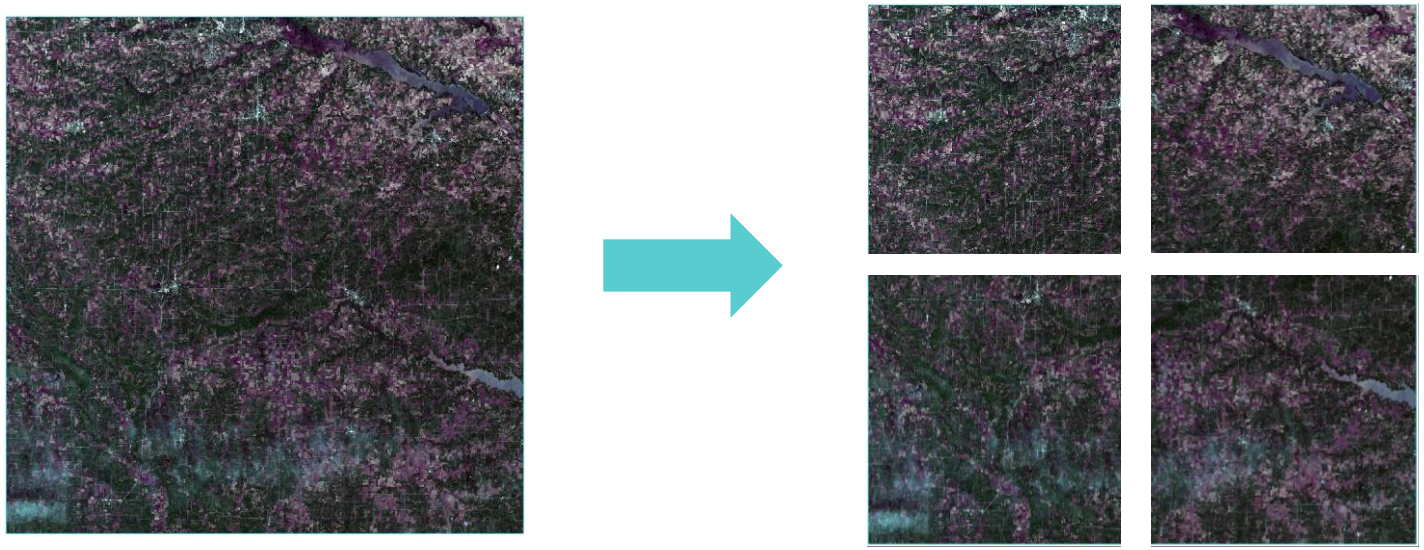
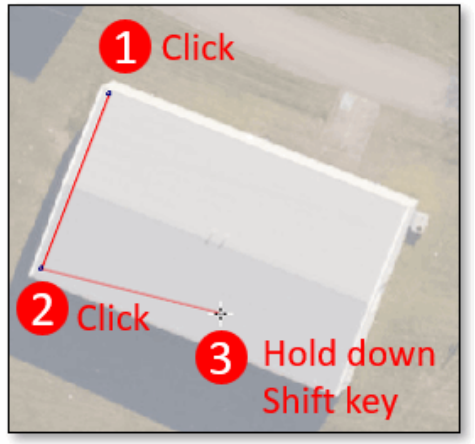


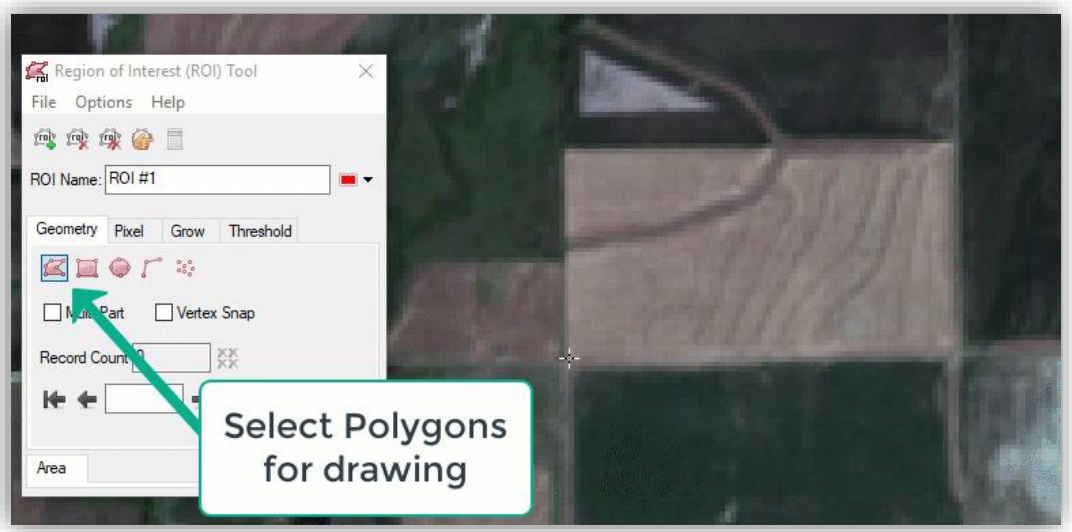
Let's try splitting our image into four quadrants that don't overlap so we don't have conflicts reading data

- 102 seconds with four processes, each processing a separate section of our image
- With our optimized process, we take 30% of our original 338 seconds to finish

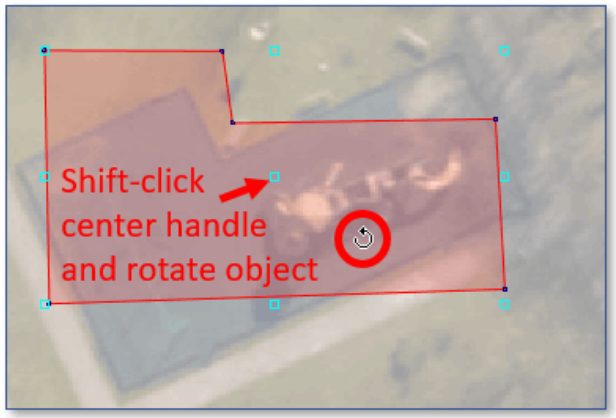
ROI Drawing Enhancements

New, simple way to draw rectangles with the ROI Tool





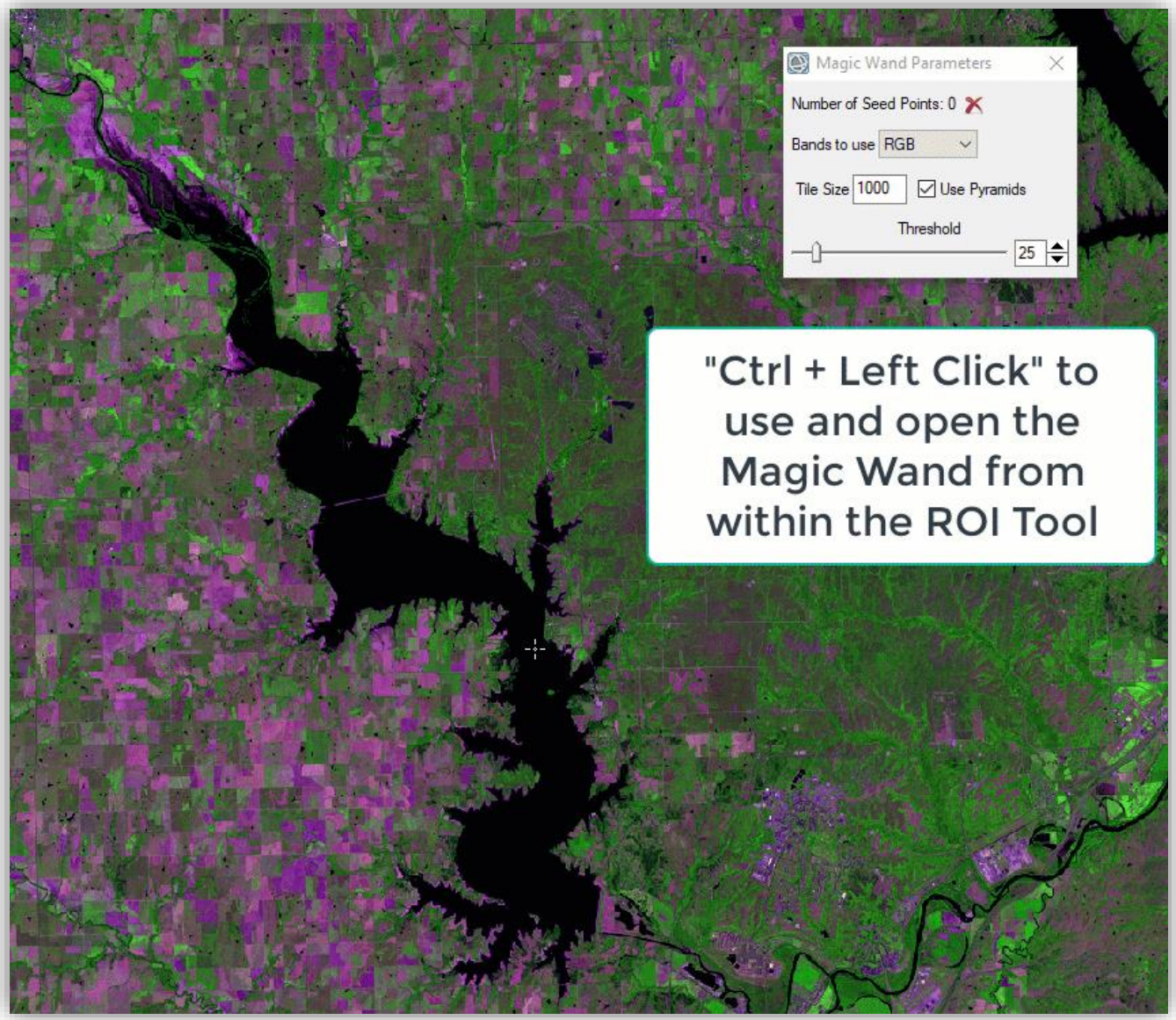
Drawn shapes can now easily be rotated



Introducing the Magic Wand!

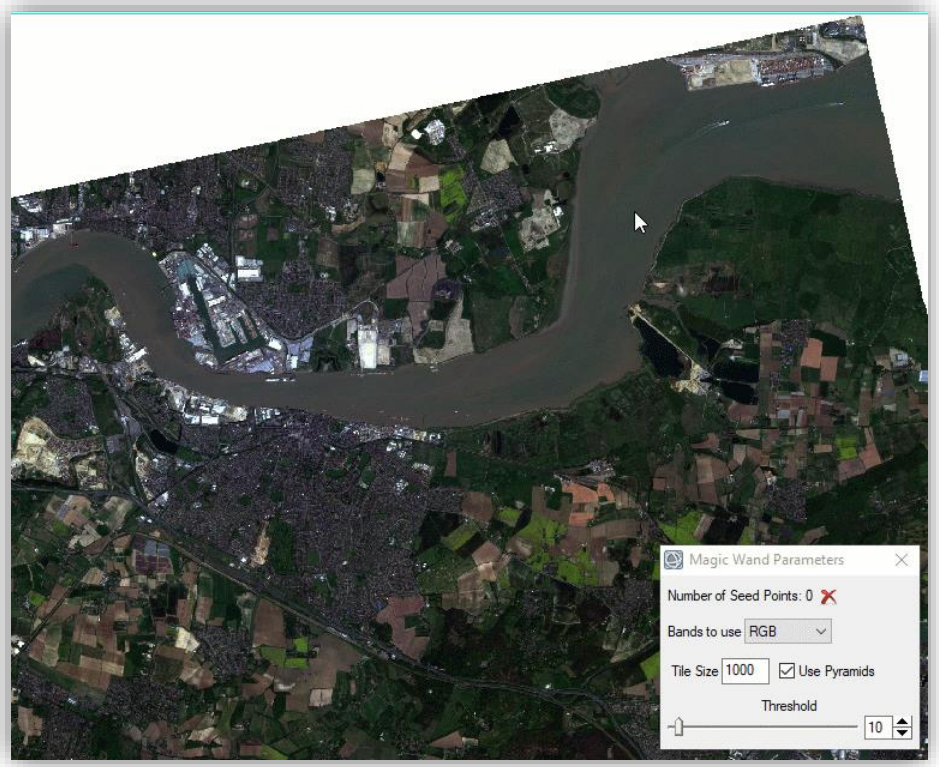
The Magic Wand is accessible through the ROI Tool and allows you to easily label complex shapes with a single click

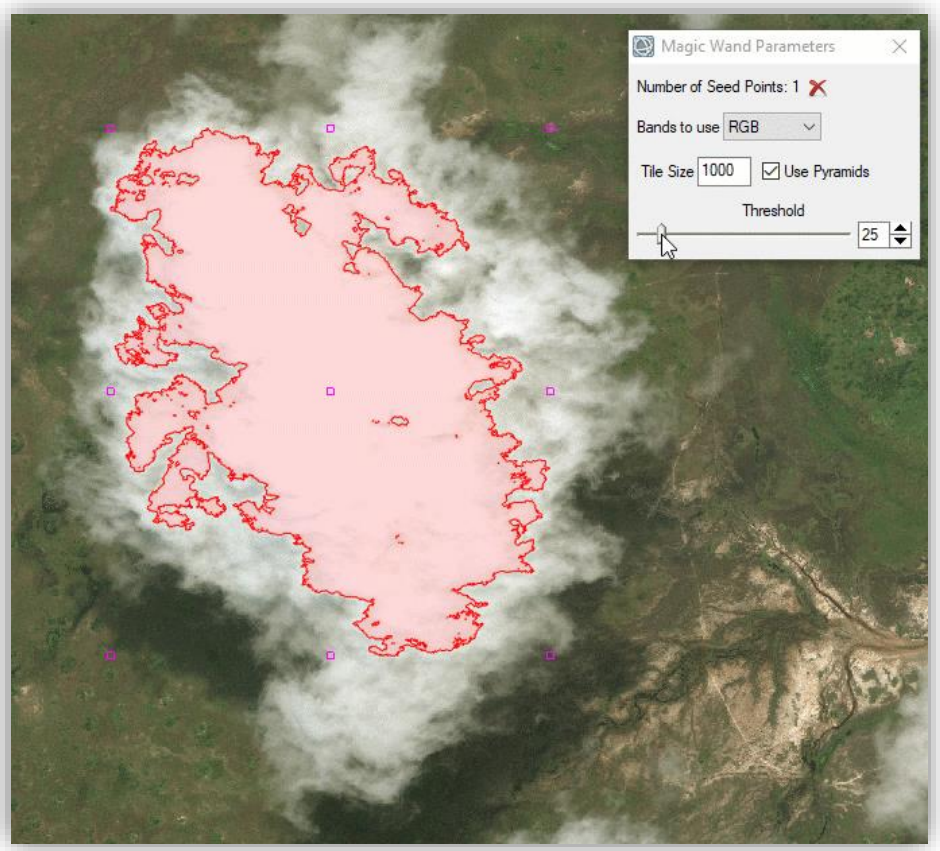
This example shows how, within seconds, you can fully label a lake using the Magic Wand



Magic Wand Examples

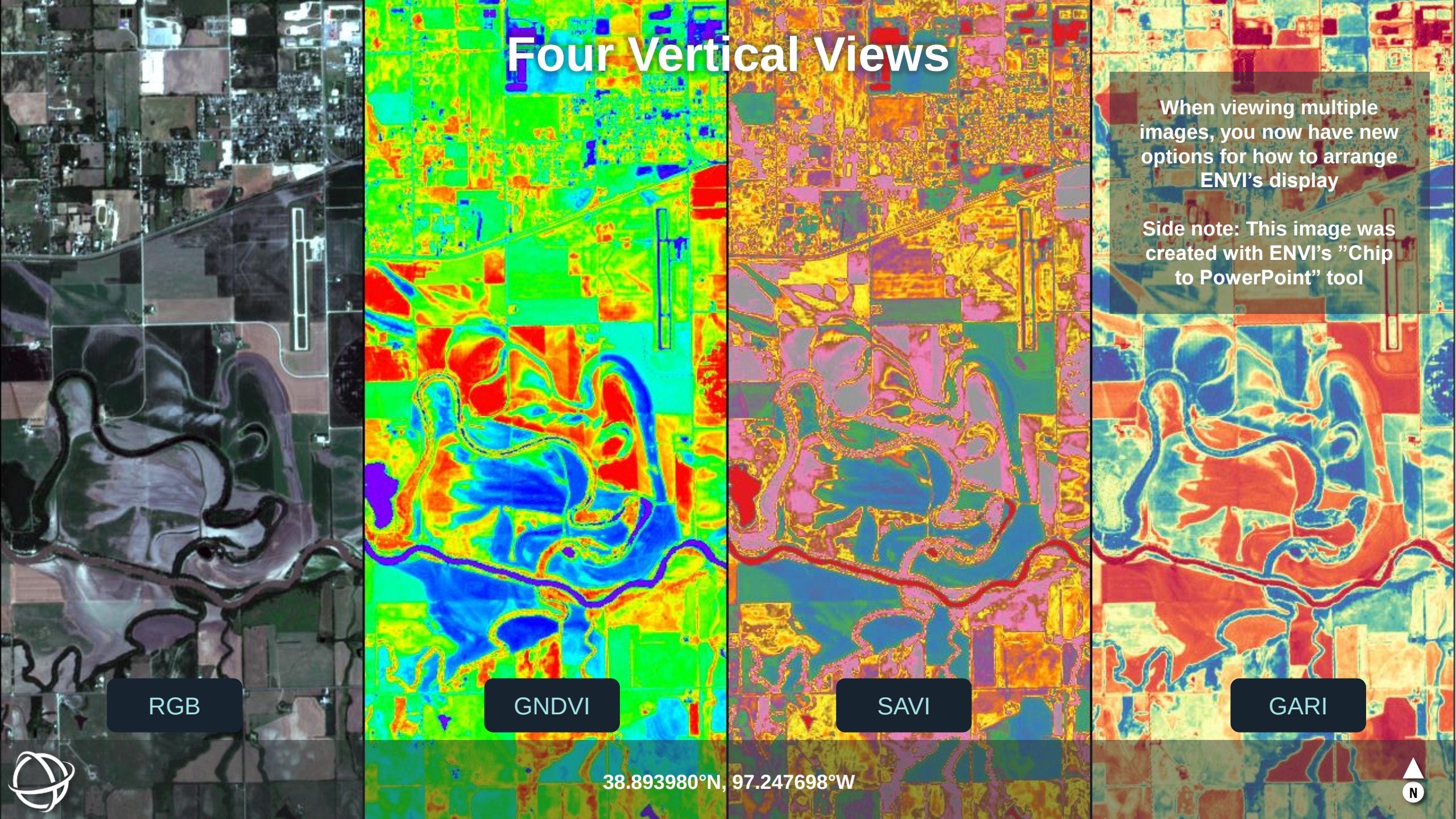
Another use case for the Magic Wand to extract a river from higher resolution satellite imagery





Select an entire cloud in seconds by adjusting the Magic Wand's threshold parameter

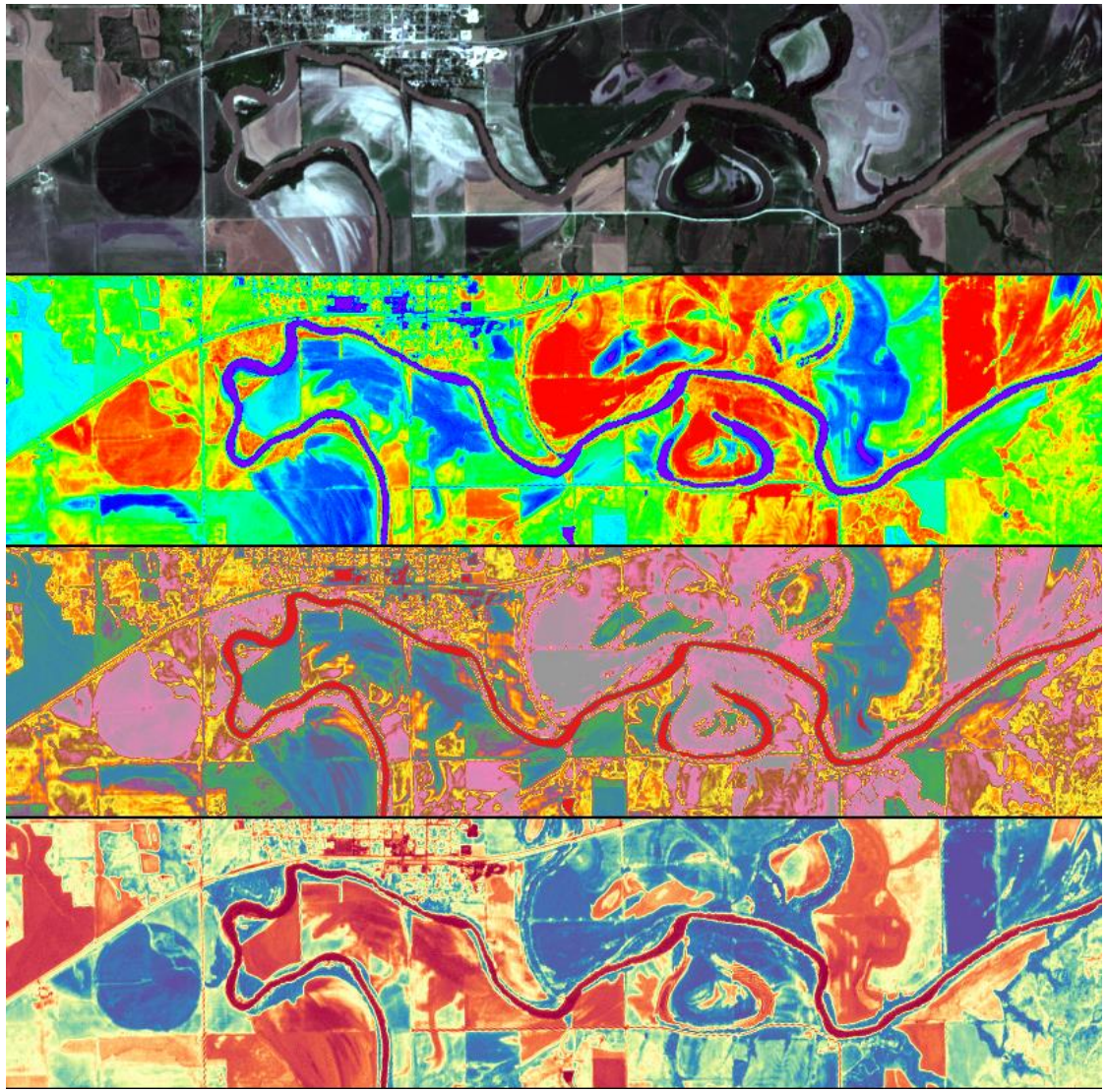
Four Vertical Views



Four Horizontal Views

RGB

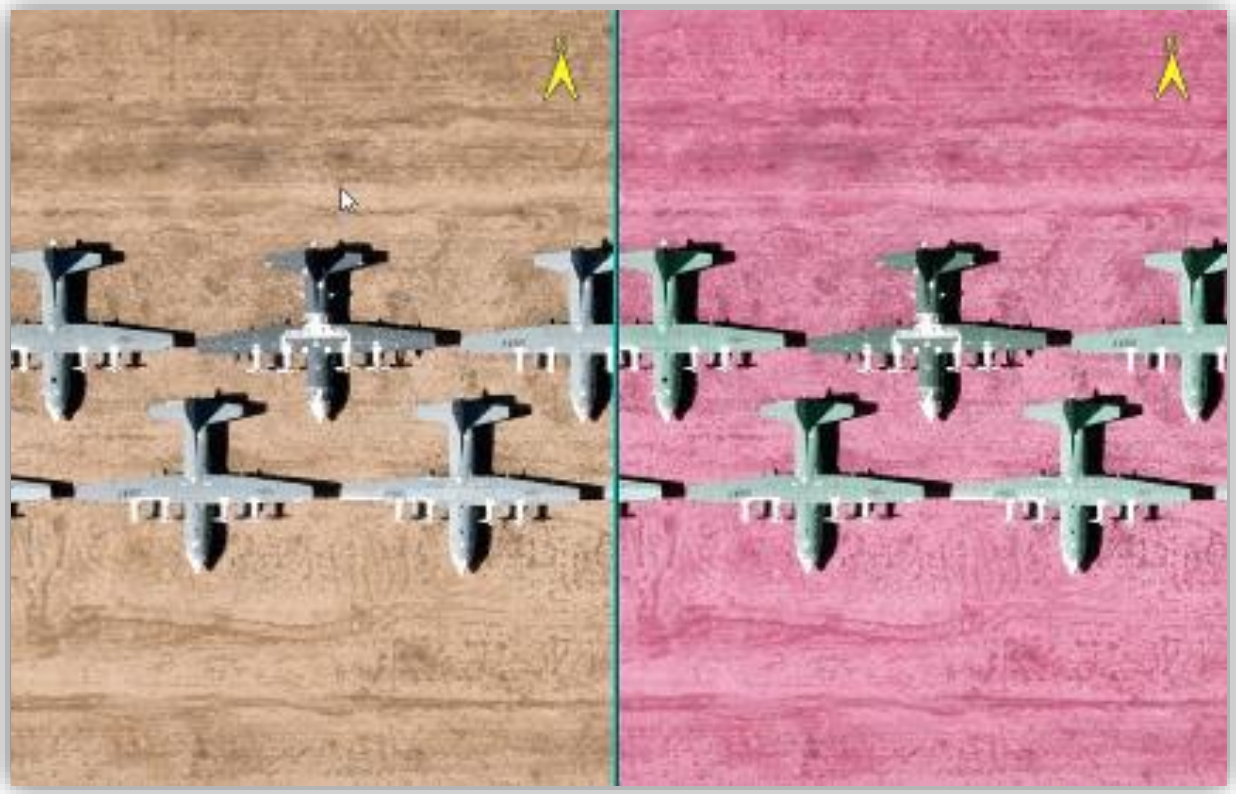
SAVI



GNDVI

GARI

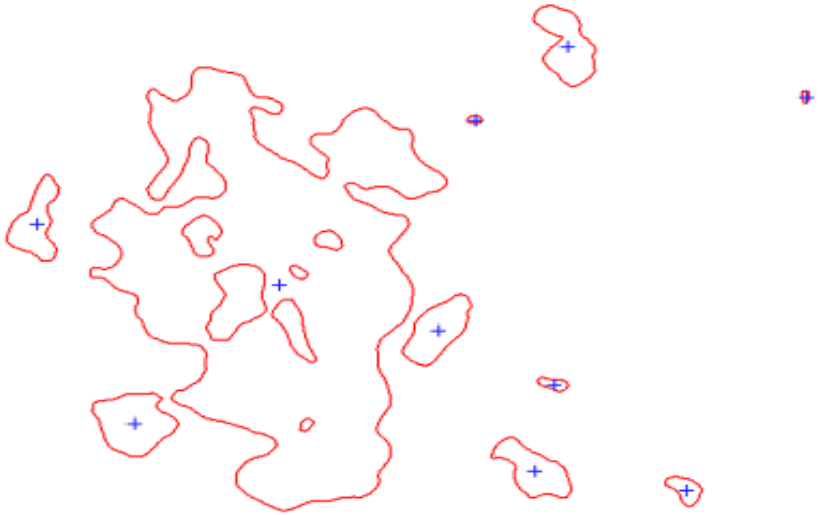
Linked View Rotation



Rotation is matched across linked views in ENVI's display

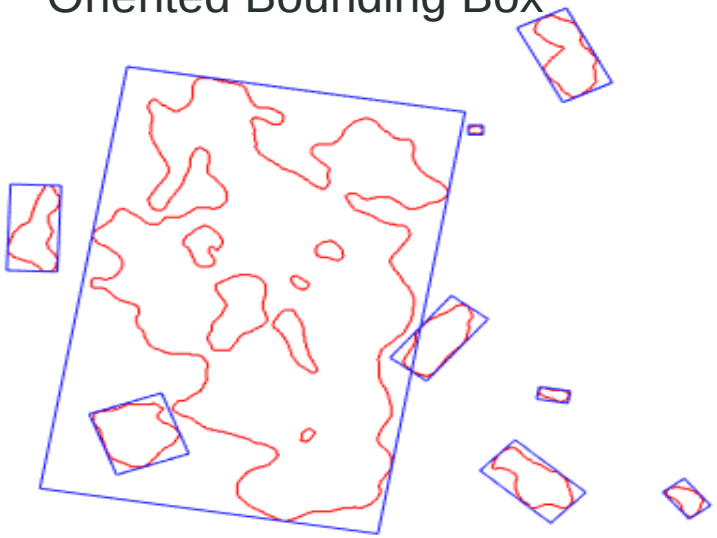
New, Vector Processing Tools

Centroids

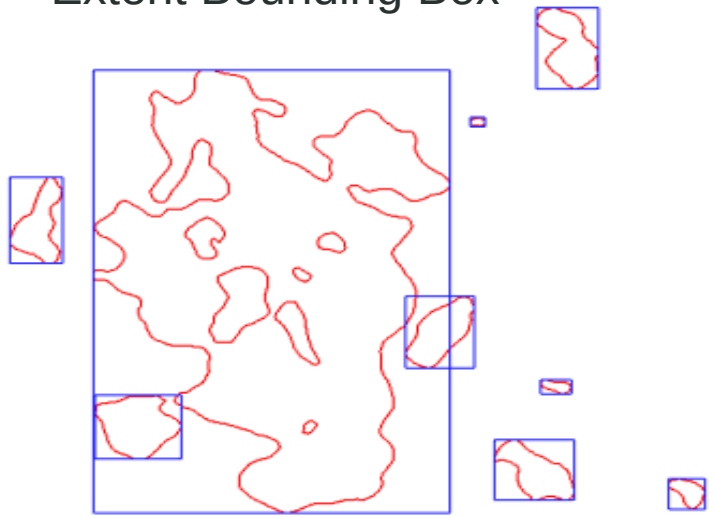


Size Filtering

Oriented Bounding Box



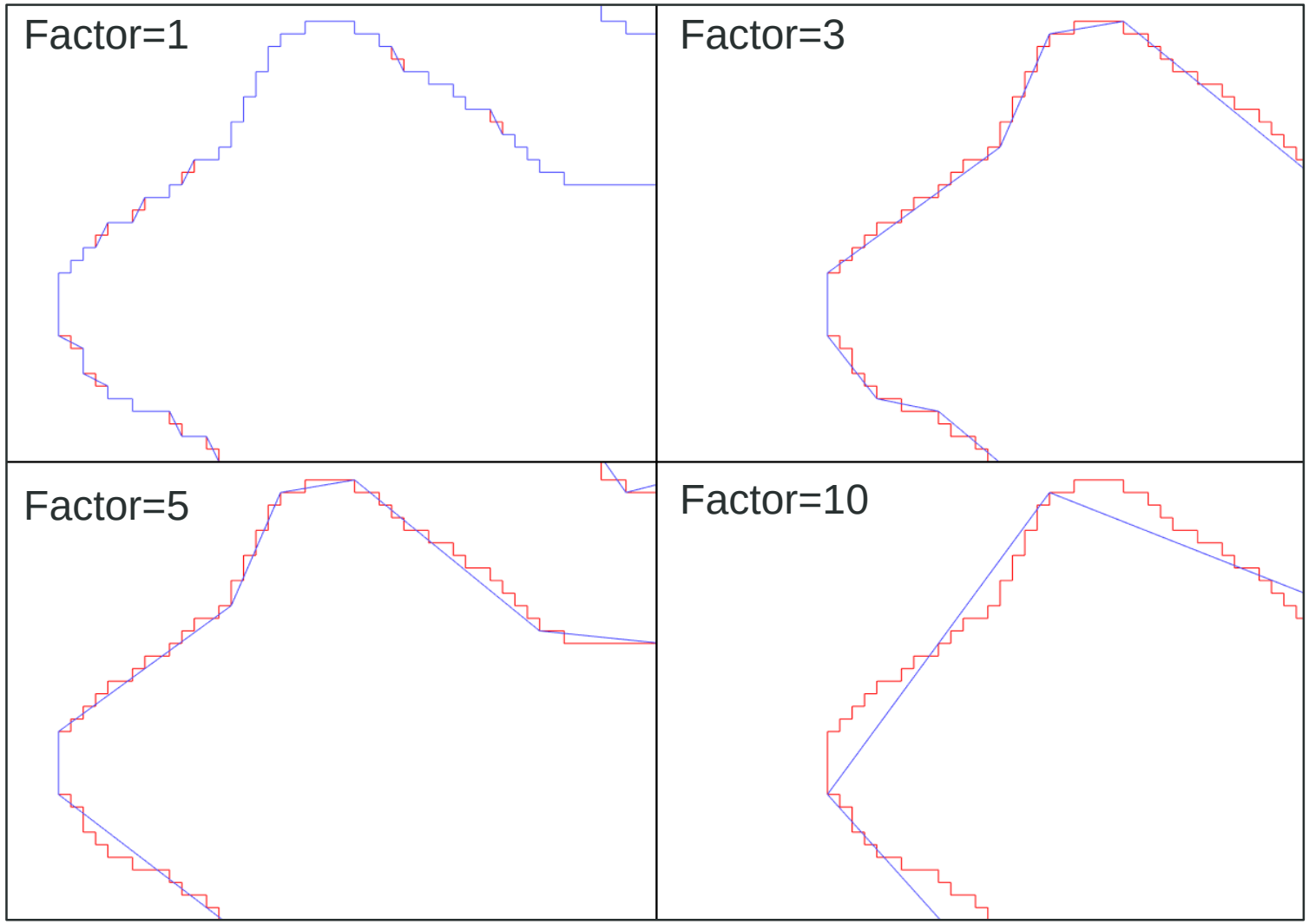
Extent Bounding Box



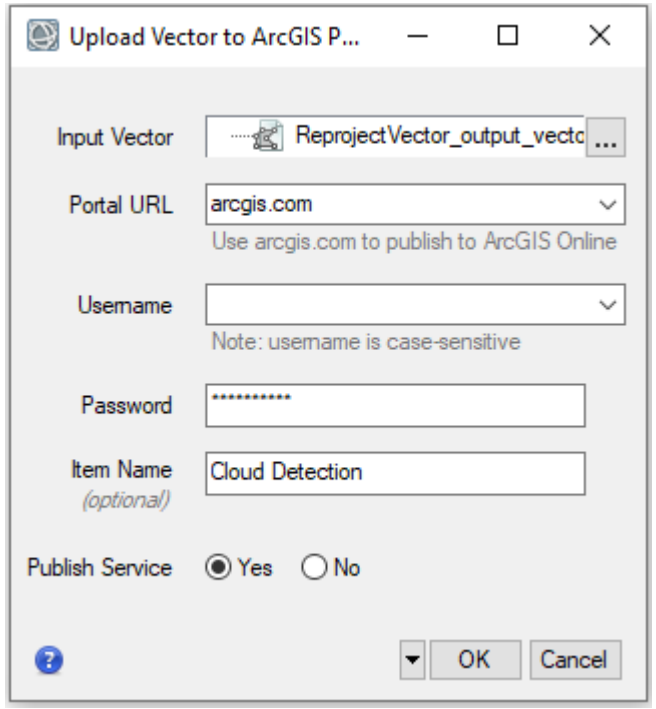
New, Vector Processing Tools: Smoothing

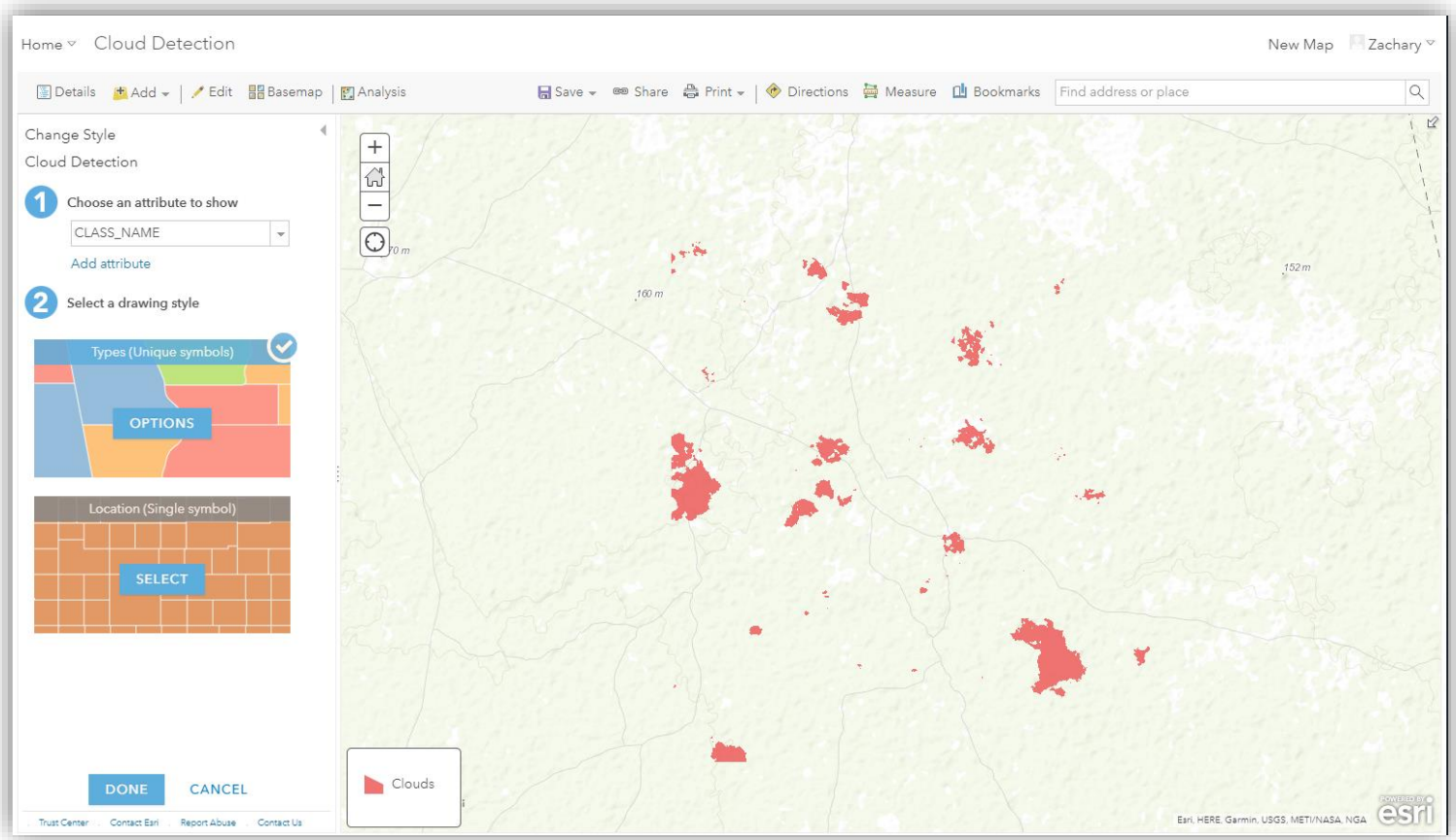
"Smooth Vector" tool uses the Douglas-Peucker smoothing algorithm for polylines and polygons

Pro-tip: For consistent results, make sure that your vectors have the same units (i.e. reproject shapefiles to the same coordinate system)

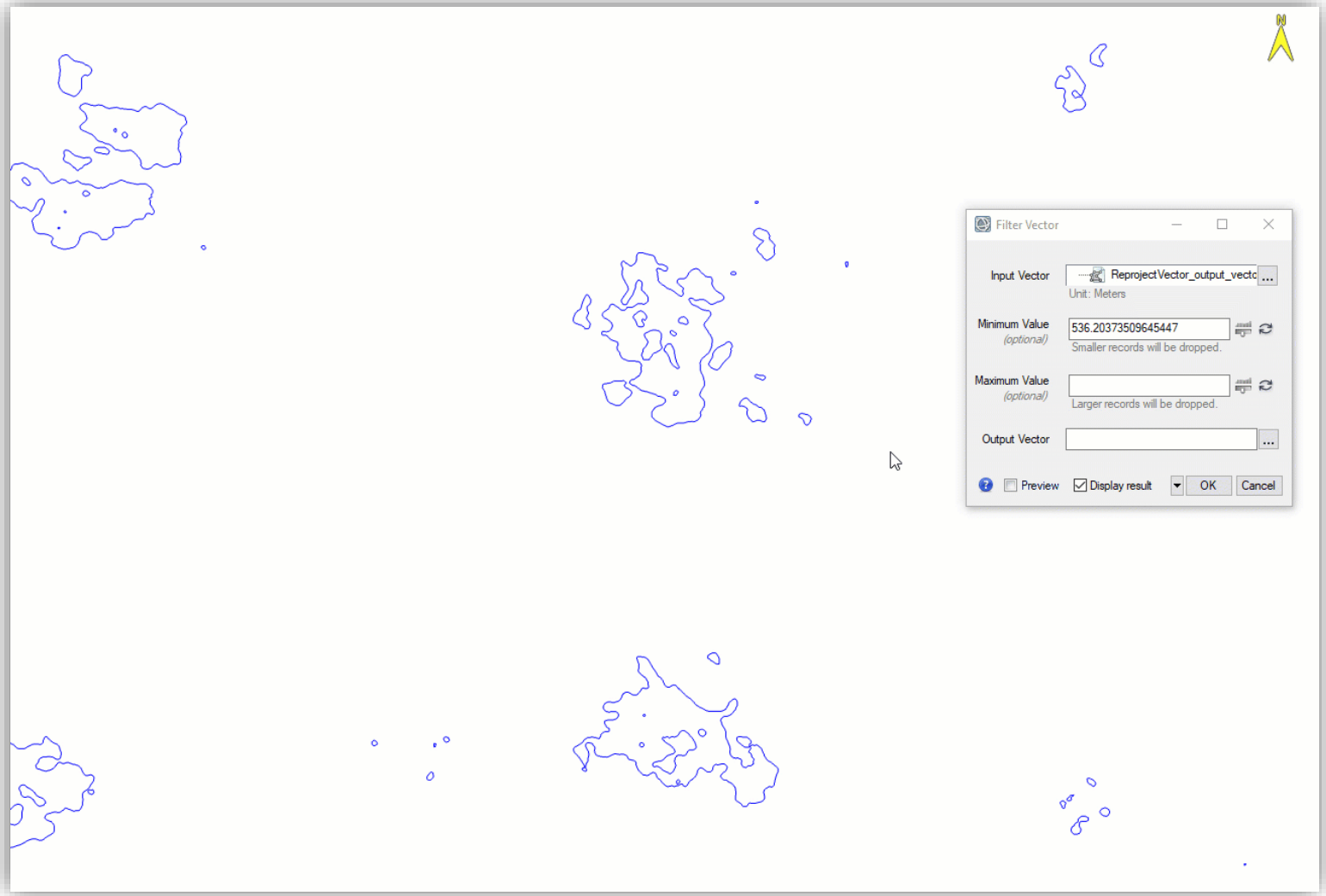


Publish Vectors to ArcGIS Portal





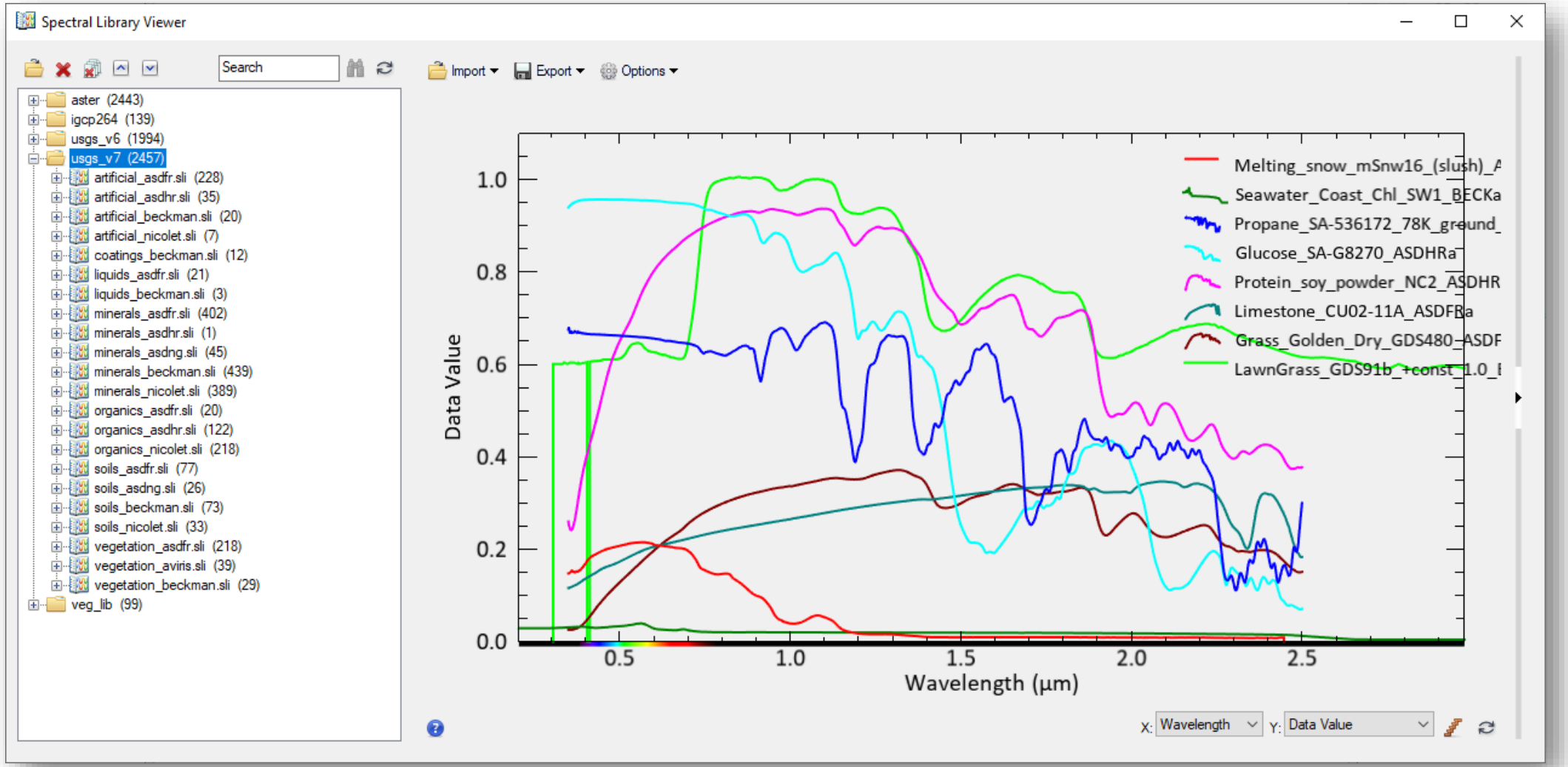
Enhanced Preview and Vector Filtering



"Filter Vector" removes entities based on size (area or length) and, with the improved Preview functionality in ENVI, view your results in near-real-time

Pro-tip: For a consistent result when filtering vectors, make sure that your vectors have the same units (i.e. reproject shapefiles to the same coordinate system)

New Spectral Libraries: USGS V7

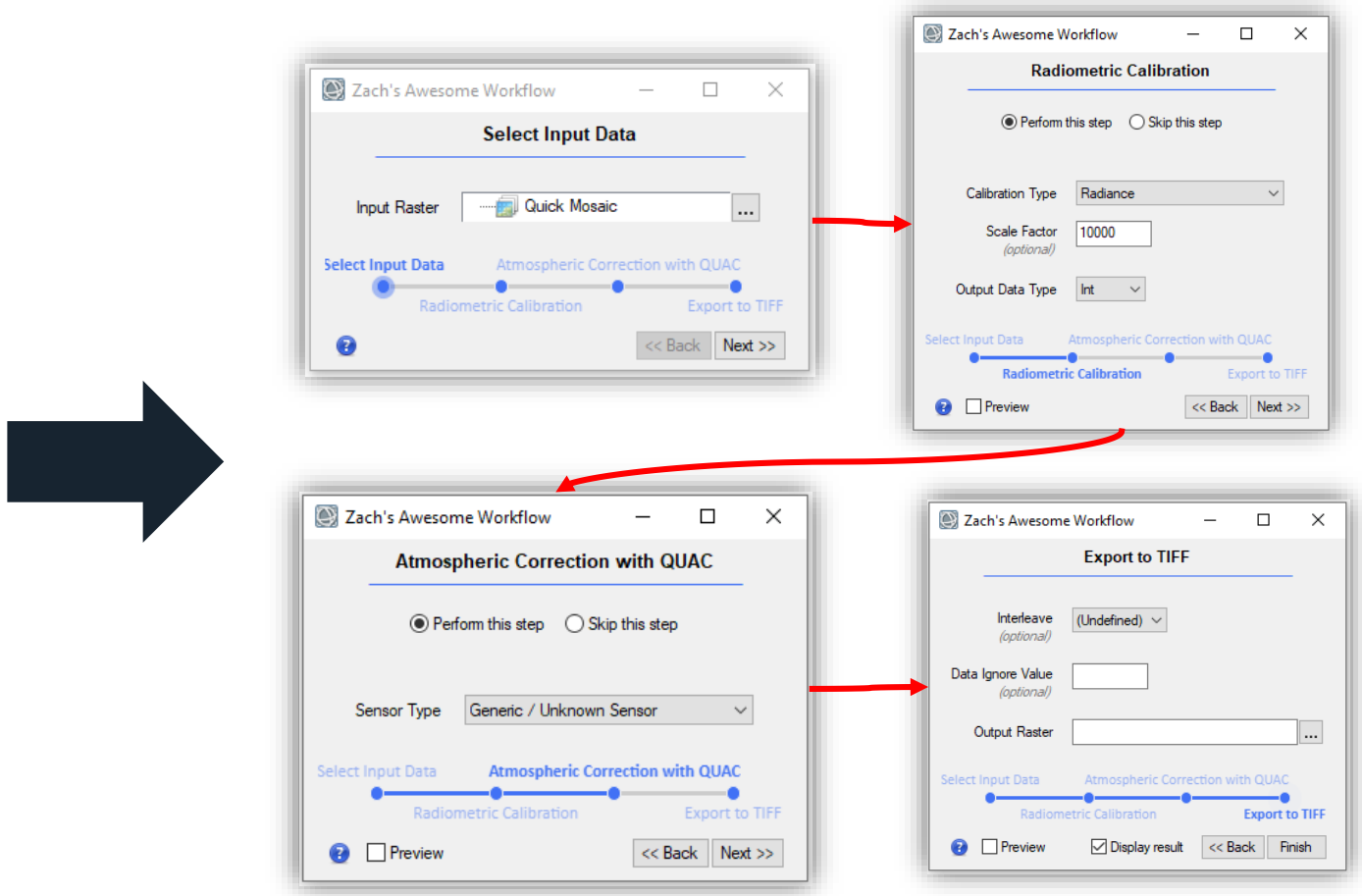


A few of the new libraries shown in ENVI's Spectral Library Viewer

ENVI Workflow API

New ENVI API to chain together ENVI Tasks and easily create step-by-step workflows for users

```
; Start the application
e = envi()

; Create an ENVIWorkflow object
workflow = ENVIWorkflow(TITLE = "Zach's Awesome Workflow")

; Add a step for selecting input data
step1 = ENVIWorkflowStep()
step1.TITLE = 'Select Input Data'
step1.task.AddParameter, ENVIParameterENVIRaster($
  NAME='INPUT_RASTER', DISPLAY_NAME='Input Raster', REQUIRED=!true)
step1.NAME = 'step_1'
step1.CALLBACK_EXECUTE = 'input_task_wrapper'

; Add a step for performing ISODATA classification
step2 = ENVIWorkflowStep()
step2.TASK = ENVITask('RadiometricCalibration')
step2.task.scale_factor = 10000
step2.task.output_data_type = 'int'
step2.CALLBACK_SKIP_STEP = 'skip_step'

; Add a step for smoothing the classification result
step3 = ENVIWorkflowStep()
step3.TITLE = 'Atmospheric Correction with QUAC'
step3.TASK = ENVITask('QUAC')
step3.CALLBACK_SKIP_STEP = 'skip_step'

; Add a step for exporting the smoothed result to TIFF format
step4 = ENVIWorkflowStep()
step4.TASK = ENVITask('ExportRasterToTIFF')

; Connect inputs and outputs
workflow.Connect, step1, 'input_raster', step2, 'input_raster'
workflow.Connect, step2, 'output_raster', step3, 'input_raster'
workflow.Connect, step3, 'output_raster', step4, 'input_raster'

; Display the workflow dialog
envi.UI.CreateWorkflowDialog, workflow
```



ENVI and IDL Updates

NOTABLE CHANGES

Updated Platform Support

- Windows 10 (Intel/AMD 64-bit)
- Macintosh 10.14 and 10.15 (Intel 64-bit)
- Linux (Intel/AMD 64-bit, kernel 3.10.0 or higher, glibc 2.17 or higher)

IDL Python Bridge now supports Python 3.7 and 3.8

ENVI 5.6 works with ArcGIS Pro versions 2.4 and 2.5; and ArcMap versions 10.5 through 10.8

ENVI's OGC WCS support updated to 2.0.1

IDL has support for more video formats that it can read

Because IDL ships with Java 11, any Java applications will need to be recompiled

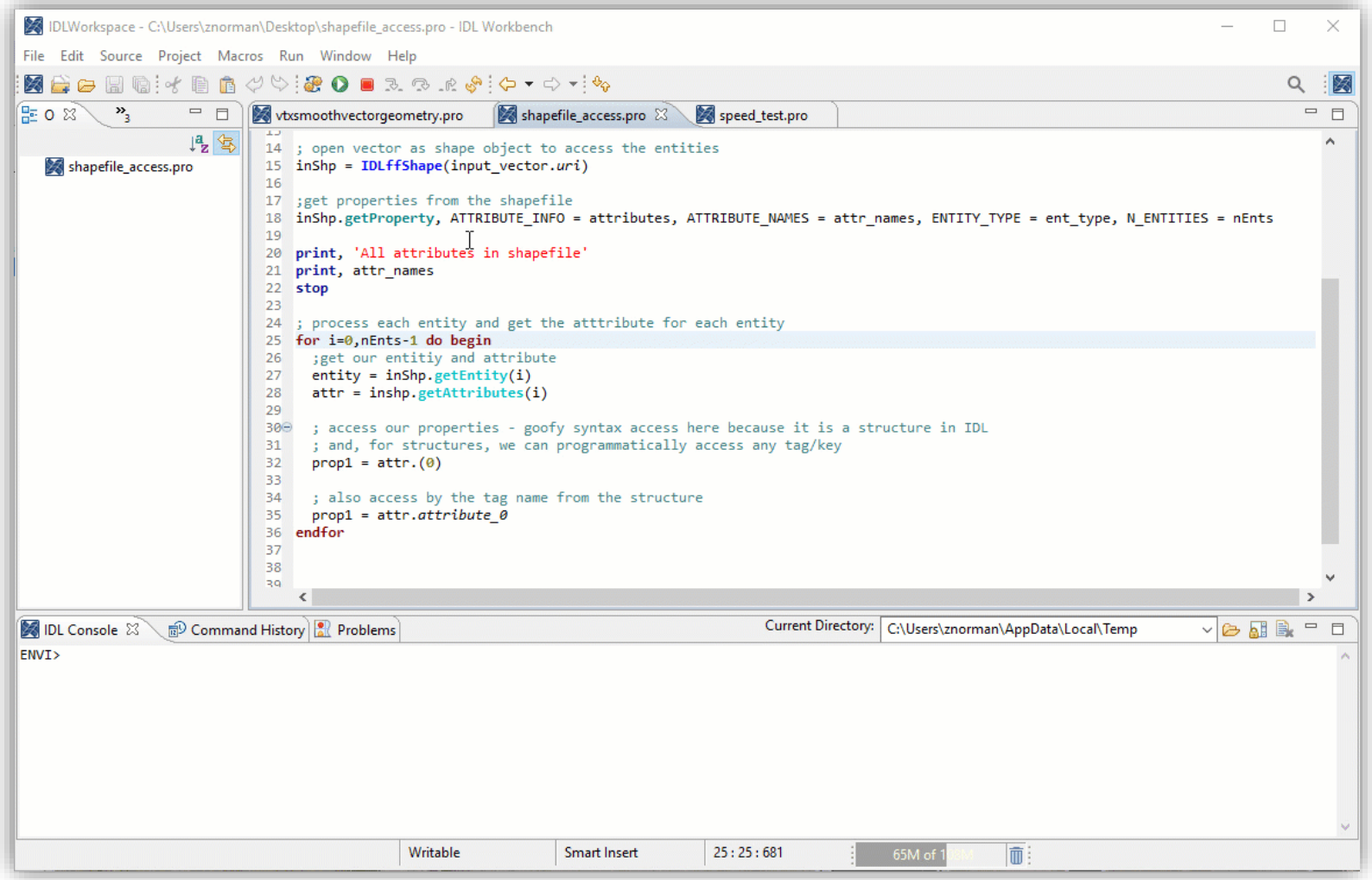
Because IDL is built with MSVC 2015 (previously it was MSVC 2010), any custom DLLs/DLMs will also need to be recompiled

LIBRARY UPDATES WORTH MENTIONING

- Java 11
- ANTLR, 2.7.5
- Apache Commons Logging, 1.1.3
- Chromium Embedded Framework, 79.1.35
- CLL, 4.0.0
- cURL, 7.66.0
- DXF, 2.003
- Eclipse CVS Client, 1.4.1200.v20191210-0610
- HDF5, 1.10.5
- JPEG was replaced with JPEG-turbo library 2.0.3
- libxml2, 2.9.9
- netcdf, 4.7.1
- OpenSSL, 1.1.1d
- Proj 6.2.0

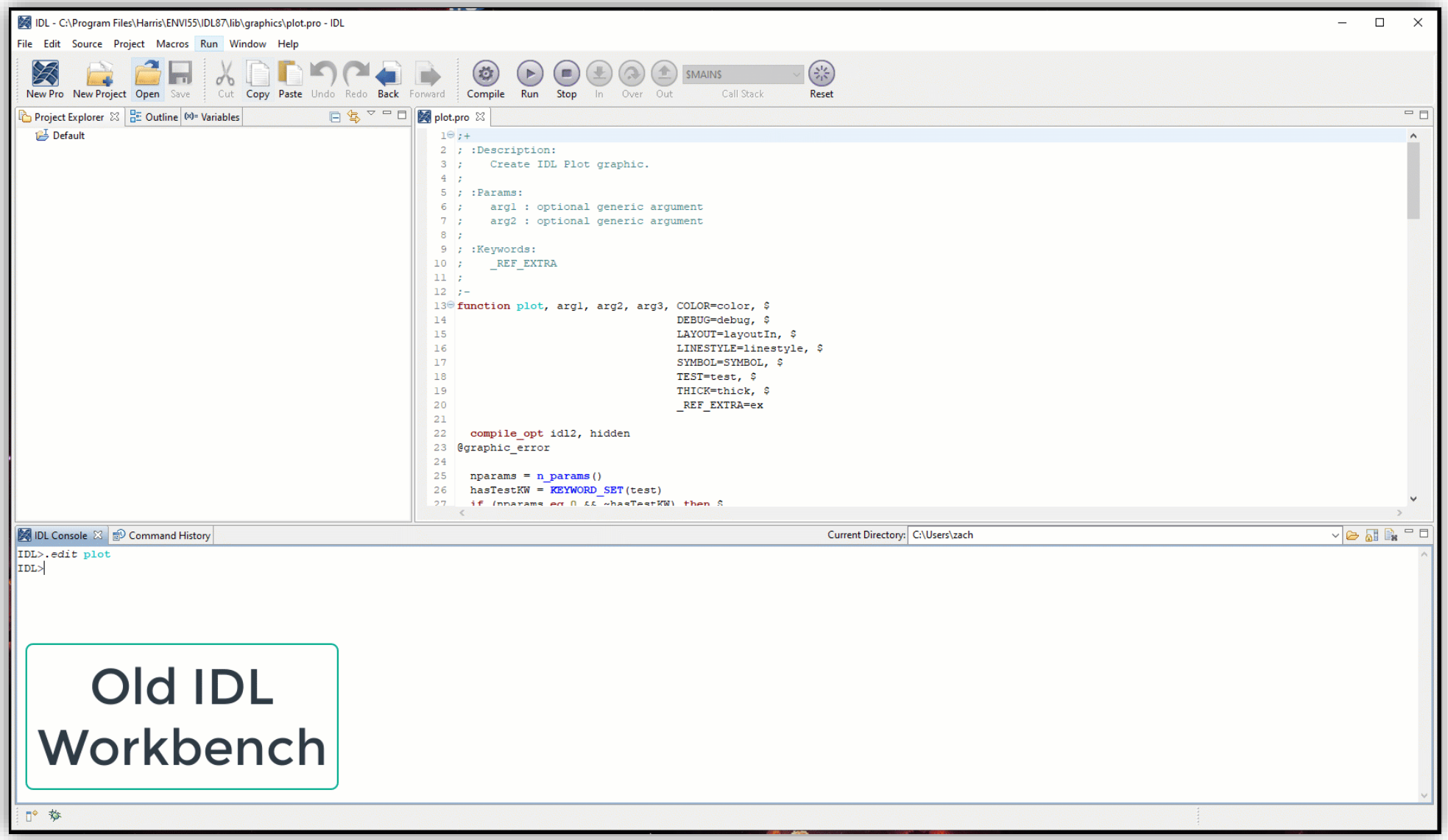
IDL Workbench Updated

- **Updated to the latest version of Eclipse**
- **Workbench now includes theming support**
- **Ships with a Dark Mode!**
- **IDL Workbench works seamlessly on Mac – no need to install legacy versions of Java**



Animation showing how to enable dark mode in the new IDL Workbench

IDL Workbench: Old vs New



IDL Performance: Library Updates Matter

With library and compiler updates, we see some general performance improvements in IDL 8.8 compared to IDL 8.7.3

Test Machine Details:

- **Windows 10**
- **12 CPUs (Intel)**
- **32 GB RAM**
- **SSD**

Performance improvements may vary by machine and OS

Name of Test	IDL 8.7.3 Time (s)	IDL 8.8 Time (s)	Time Saved (s)	Improvement (%)
Empty for loop	22.9060002	20.3440003	2.562	11.2
Empty foreach loop	100.453	97.6119999	2.841	2.8
Add scalar	85.8540001	85.3620003	0.492	0.6
Take alog of a scalar	348.154	324.728	23.426	6.7
Forward and inverse FFT	784.459	712.355	72.104	9.2
Create an empty list	706.059	653.508	52.551	7.4
Create an empty hash	1994.228	1237.632	756.596	37.9
Multiply byte array by constant	1491.075	1382.138	108.937	7.3
Add constant to byte array	1449.155	1364.992	84.163	5.8
Multiply two byte arrays	192.885	145.561	47.324	24.5
Add two byte arrays	178.386	171.184	7.202	4
Add two float arrays	1319.376	1277.627	41.749	3.2
Shift byte array	99.7449998	79.6540003	20.091	20.1
Take alog of float array	2301.942	2163.217	138.725	6
Smooth byte array with 5x5 kernel	954.929	907.71	47.219	4.9
Smooth float array with 5x5 kernel	413.789	377.715	36.074	8.7
Generate randomu array	592.908	558.843	34.065	5.7

Virtual ENVI Analytics Symposium!

Learn more and register at: www.l3harrisgeospatial.com/EAS

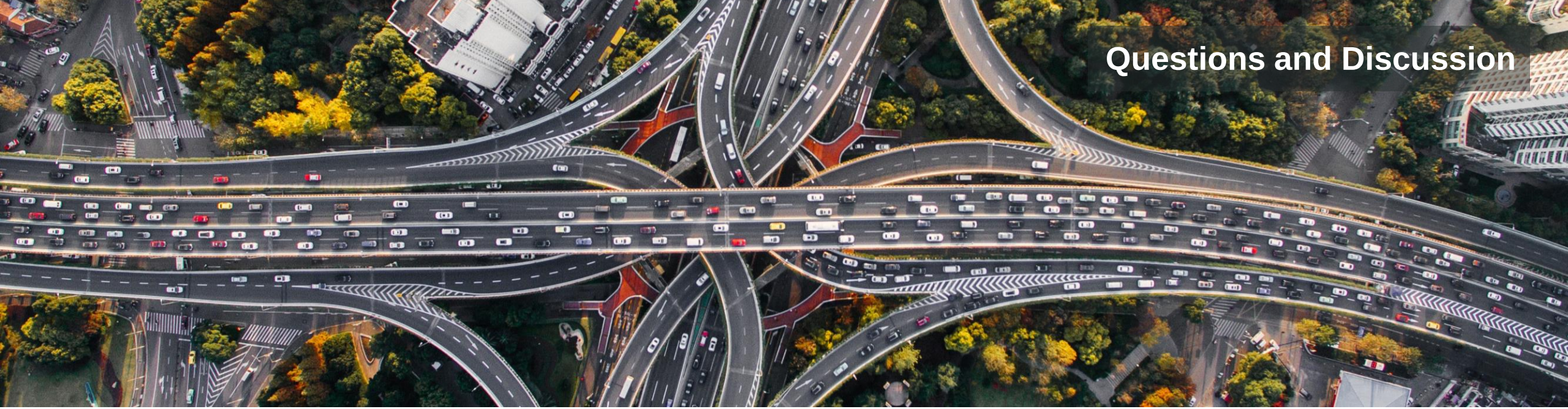
2020 THEME

The theme of the 2020 EAS is "The Geospatial Vision for the Next Decade." Collecting, analyzing and applying geospatial data is evolving at a rapid pace. EAS provides the premiere thought leadership venue for the community of geospatial users, analysts, scientists, and vendors to connect and explore the new trends and solutions transforming this dynamic ecosystem.

WHAT WILL ATTENDEES WALK AWAY WITH?

Attendees:

- Listen to analytical thought leaders discuss the future of the industry
- Hear details of successful real-world analytical applications
- Learn tips, tricks, and best practices for using analytics and ENVI
- Test different products, improve technical skills, and gain new analysis



Questions and Discussion

Release details: https://www.l3harrisgeospatial.com/Support/Maintenance

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